

Claims:

1. A method for producing phospholipids that contain LCPUFA as a constituent (LCPUFA-PL), wherein lipid producing cells producing lipids that contain long-chain polyunsaturated fatty acids (LCPUFA) as constituents are used as a starting material,

said method comprising a PL extracting step of extracting phospholipids (PL) from defatted cells obtained by extracting triglyceride (TG)-containing oil or fat from the lipid producing cells.

2. The method as set forth in claim 1, further comprising an oil or fat extracting step of extracting TG-containing oil or fat from the lipid producing cells and obtaining the defatted cells, the oil or fat extracting step being carried out before the PL extracting step.

3. The method as set forth in claim 1 or 2, wherein the lipid producing cells are at least one kind selected from the group consisting of: *Mortierella*; *Conidiobolus*; *Pythium*; *Phytophthora*; *Penicillium*; *Cladosporium*; *Mucor*; *Fusarium*; *Aspergillus*; *Rhodotorula*; *Entomophthora*; *Echinosporangium*; and *Saprolegnia*.

4. The method as set forth in claim 3, wherein the

lipid producing cells that belong to genus *Mortierella* also belong as subgenus *Mortierella*.

5. The method as set forth in claim 4, wherein the cells that belong to subgenus *Mortierella* are *Mortierella alpina*.

6. The method as set forth in any one of claims 1 through 5, wherein, in the PL extracting step, an extract of at least one of an aliphatic organic solvent and water, or supercritical carbon dioxide gas is used as an extractant used to extract PL from the defatted cells.

7. The method as set forth in claim 6, wherein the aliphatic organic solvent is a saturated hydrocarbon, an alcohol, a mixed solvent of saturated hydrocarbon and alcohol, or a mixed solvent of halogenated hydrocarbon and alcohol.

8. The method as set forth in claim 6 or 7, wherein the extract is at least one of hexane, ethanol, methanol, hydrous ethanol, isopropyl alcohol, and acetone.

9. The method as set forth in claim 8, wherein the extract is a mixed solvent of hexane and ethanol.

10. The method as set forth in claim 9, wherein a hexane:ethanol ratio of the mixed solvent of hexane and ethanol is in a range of 4:1 to 0:6 by volume.

11. The method as set forth in any one of claims 1 through 10, wherein, in the oil or fat extracting step, the oil or fat is extracted from the lipid producing cells using at least one of compression extraction employing applied pressure, rendering extraction, and extraction using an extractant.

12. The method as set forth in claim 11, wherein an extract of at least one of an aliphatic organic solvent and water, or supercritical carbon dioxide gas is used as the extractant.

13. The method as set forth in claim 12, wherein hexane is used as the aliphatic organic solvent.

14. The method as set forth in any one of claims 2 through 13, wherein the lipid producing cells used in the oil or fat extracting step are dried cells.

15. Phospholipids produced by a method of any one of claims 1 through 14.

16. The phospholipids as set forth in claim 15, wherein a constituent LCPUFA is at least one kind selected from the group consisting of: eicosadienoic acid, eicosatrienoic acid, eicosatetraenoic acid, eicosapentaenoic acid, docosadienoic acid, docosatrienoic acid, docosatetraenoic acid, docosapentaenoic acid, docosahexaenoic acid, tetracosadienoic acid, tetracosatrienoic acid, tetracosatetraenoic acid, tetracosapentaenoic acid, and tetracosahexaenoic acid.

17. The phospholipids as set forth in claim 16, wherein at least one of C-C double bonds in a LCPUFA molecule is conjugated.

18. The phospholipids as set forth in claim 16 or 17, wherein the LCPUFA includes arachidonic acid and/or docosahexaenoic acid.

19. The phospholipids as set forth in claim 18, wherein a proportion of arachidonic acid with respect to total fatty acids contained as constituents of total LCPUFA-PL is 20 percent by weight or greater.

20. The phospholipids as set forth in any one of claims 16 through 19, wherein the LCPUFA-PL is at least

one kind of glycerophospholipid selected from the group consisting of: phosphatidylcholine; phosphatidylserine; phosphatidylethanolamine; phosphatidylinositol; phosphatidic acid; and cardiolipin.

21. The phospholipids as set forth in claim 20, wherein the LCPUFA-PL is at least phosphatidylcholine, and

wherein a proportion of arachidonic acid with respect to total fatty acids contained as constituents of total phosphatidylcholine is 15 percent by weight or greater.

22. The phospholipids as set forth in claim 20, wherein the LCPUFA-PL is at least phosphatidylserine, and

wherein a proportion of arachidonic acid with respect to total fatty acids contained as constituents of total phosphatidylserine is 5 percent by weight or greater.

23. Phospholipids (LCPUFA-PL) including a long-chain polyunsaturated fatty acids (LCPUFA) as constituents,

wherein the LCPUFA-PL includes at least phosphatidylcholine and phosphatidylserine, and the LCPUFA includes at least arachidonic acid, and

wherein a proportion of arachidonic acid with respect to total fatty acids contained as constituents of total phosphatidylcholine is 40 percent by weight or greater, and a proportion of arachidonic acid with respect to total fatty acids contained as constituents of total phosphatidylserine is 20 percent by weight or greater.

24. The phospholipids as set forth in claim 23, wherein the LCPUFA-PL includes phosphatidylcholine that at least includes dihomo- γ -linolenic acid as LCPUFA, and

wherein a proportion of dihomo- γ -linolenic acid with respect to total fatty acids contained as constituents of total phosphatidylcholine is 3 percent by weight or greater.

25. The phospholipids as set forth in claim 23 or 24, wherein the LCPUFA-PL includes phosphatidylserine that at least includes dihomo- γ -linolenic acid as LCPUFA, and

wherein a proportion of dihomo- γ -linolenic acid with respect to total fatty acids contained as constituents of total phosphatidylserine is 1 percent by weight or greater.

26. A method of producing a lipid composition,

comprising:

a PL extracting step of the method according to any one of claims 1 through 14; and

a solution preparing step of preparing a phospholipid solution by dissolving the LCPUFA-PL-containing PL obtained in the PL extracting step in a liquid lipid that contain LCPUFA as a constituent.

27. The method as set forth in claim 26, further comprising an oil or fat extracting step, wherein oil or fat obtained in the oil or fat extracting step is used as the liquid lipid.

28. The method as set forth in claim 27, wherein an amount of oil or fat extracted in the oil or fat extracting step is suppressed, so as to extract in the PL extracting step the LCPUFA-PL as a lipid composition dissolved in the liquid lipid.

29. A lipid composition produced by a method of claim 26, 27, or 28, comprising:

LCPUFA-PL; and

a liquid lipid whose constituent is LCPUFA.

30. The lipid composition as set forth in claim 29,

wherein a proportion of LCPUFA with respect to total fatty acids of the liquid lipid is 11 percent by weight or greater.

31. A lipid composition containing phospholipids of any one of claims 15 through 25.

32. The lipid composition as set forth in claim 29, 30, or 31 which is used as a nutritional composition.

33. The lipid composition as set forth in any one of claims 29 through 32, which is processed into a capsule or tablet.

34. Food containing the lipid composition of any one of claims 29 through 33.

35. The food as set forth in claim 34, which is an oil-in-water dispersion liquid in the form of a liposome formed by the phospholipids.

36. The food as set forth in claim 34 or 35, which is a nutriment.